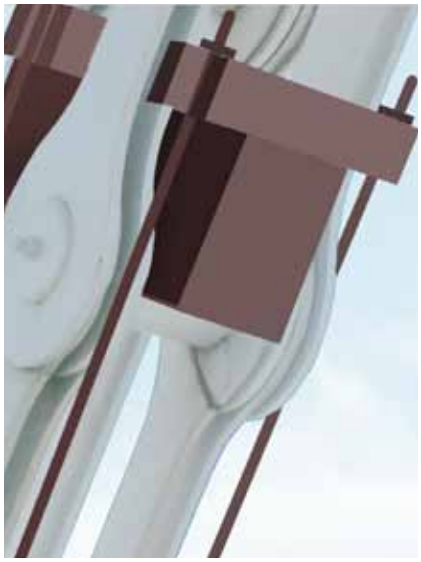
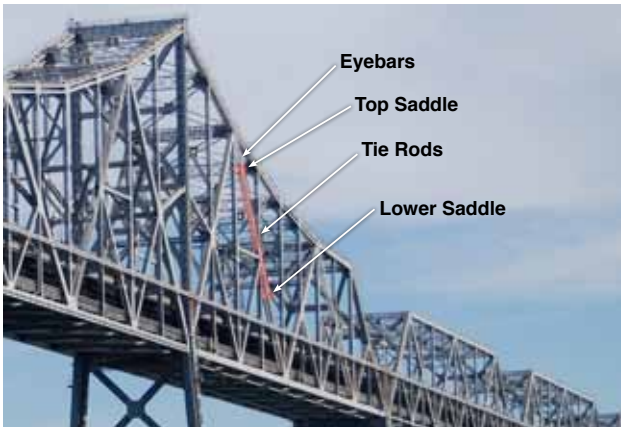
EYEBAR REPAIR FACTSHEET

LABOR DAY WEEKEND, A CRACK WAS DISCOVERED IN A CRITICAL MEMBER OF THE ORIGINAL EAST SPAN

During the 2009 Labor Day weekend closure of the San Francisco-Oakland Bay Bridge, engineers inspecting the bridge discovered a crack in an eyebar, a critical piece of structural steel on the East Span.

Although the crack was unrelated to the weekend's connection of a detour on Yerba Buena Island, it was significant enough to have closed the bridge on its own.





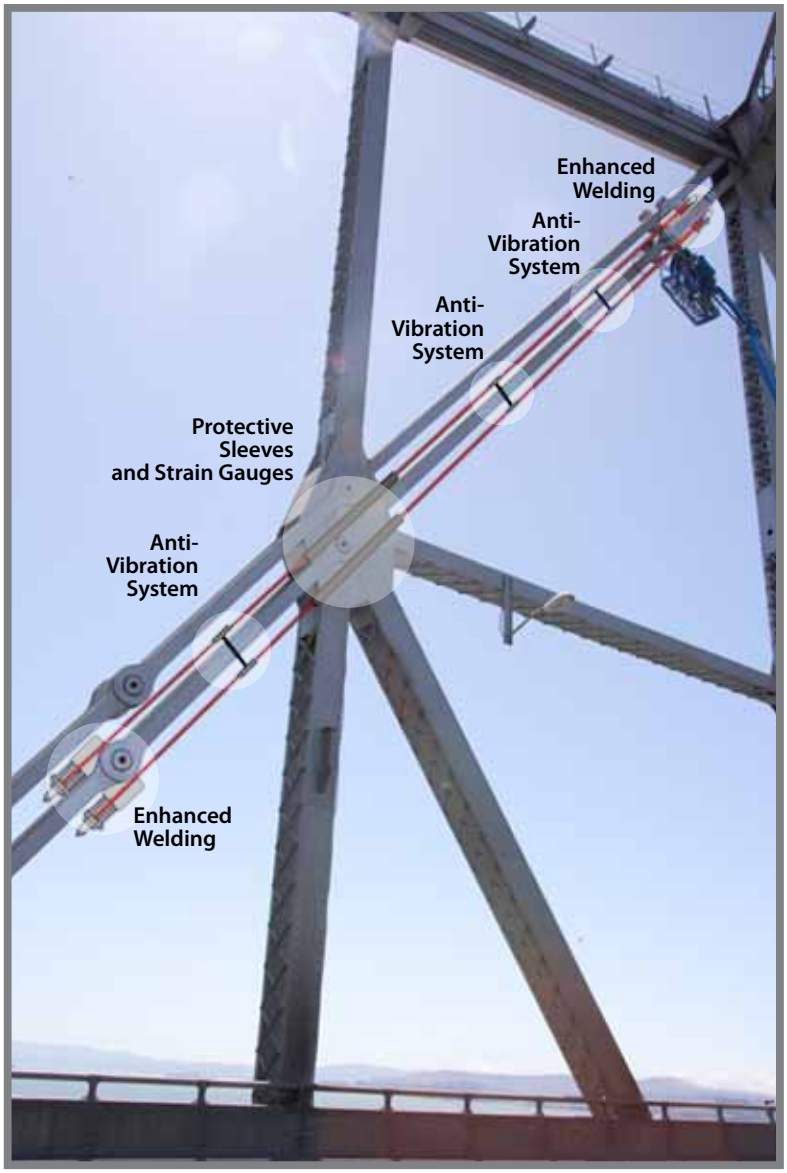
Engineers found the damaged eyebar – one of 1,680 on the bridge – during a regularly scheduled inspection. Caltrans conducts thorough inspections every two years as mandated by federal law. The crack had occurred in the two years between inspections; rust in the crack indicated that it was not caused by the weekend's detour construction.

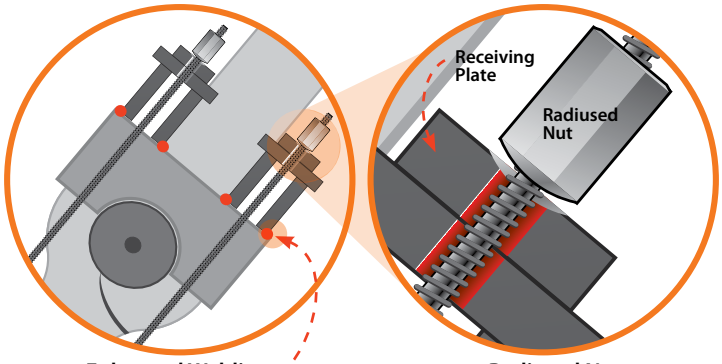
Workers and much of the material to fix the crack were already on site for the unrelated construction. Crews worked nearly 70 hours nonstop to repair the damaged eyebar.

During the evening of Tuesday, Oct. 27, a high-strength tie rod failed, due to fatigue-stress, most likely caused by excessive movement of the rod during high-winds resulting in metal-on-metal contact.

The failed tie rod pulled down another tie rod and a steel cross bar from the top saddle which fell onto the upper deck of the Bay Bridge. Caltrans immediately closed the Bay Bridge and began designing repairs.

DESIGN





Engineers developed a design that would augment and enhance the system put in place during Labor Day weekend, which addresses the lost load carrying capacity of the damaged eyebar. This updated design has achieved three things:

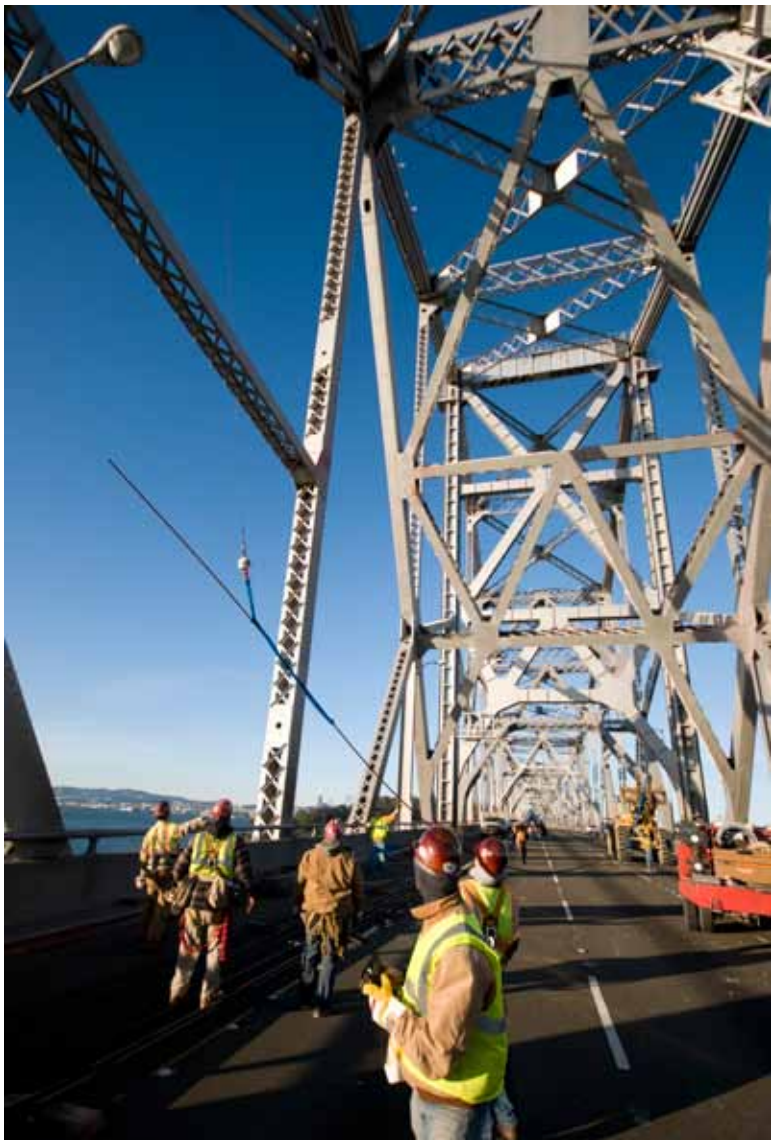
- ***Significantly reduced vibration in the tie rods***
  Engineers achieved this by developing a turnbuckle system that lashed the tie rods and eyebars together.
- ***Reduced potential for metal-on-metal contact***
  Radiused nuts were used to secure the tie rods, which keeps them centered in their holes to minimize any metal-on-metal contact.

  Additionally, protective sleeves were wrapped around the tie rods to prevent them from rubbing against the eyebars.
- ***Secured the repair system components in place***
  Enhanced welds connect the cross bars to the saddles.

  Tie rods are secured by a new anti-vibration system

  Saddles and tie rod ends are secured by tethering straps and cables.

INSTALLATION

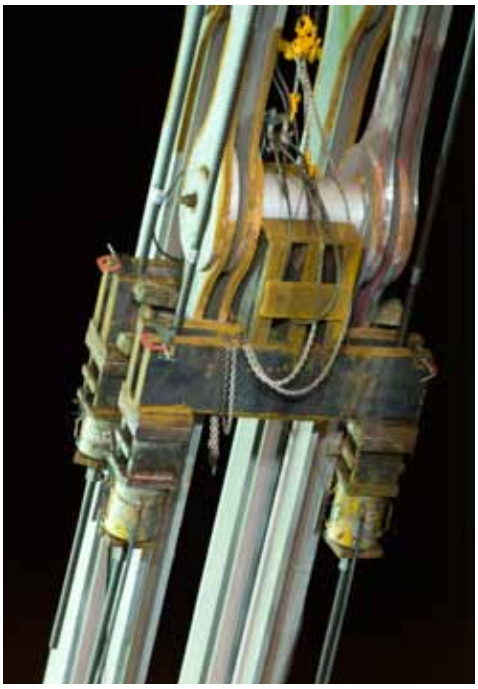


Installing the updated repair entailed replacing all four tie rods, enhancing the welds, installing the anti-vibration system, centering the rods, and maintaining alignment of those rods.

The installation also included extensive cutting, grinding and custom fitting to minimize the potential for metal-on-metal contact.

Crews worked for nearly 130 hours to complete the enhanced repair and support system.

TESTING & INSPECTION



Once the repair was installed and stress testing was completed, the enhanced system was scrutinized by independent and respected experts—members of the Federal Highway Administration; Professor Frieder Seible, Dean of Jacobs School of Engineering at the University of California at San Diego, member of the Toll Bridge Program's Seismic Safety Peer Review Panel and Professor Ahmad Itani, of the Department of Civil and Environmental Engineering at the University of Nevada at Reno.

Initial daily inspections will be conducted of the repair system. The eyebars will also be inspected every three months. Other future inspections may require full bridge closures.

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